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Education in a Changing Technological Environment

Abstract

The main ideas of this article are the following: (1) Education in a knowledge-based society takes place in a technology-based society. Therefore, we must pay attention to the technological possibilities and changes. (2) On the one hand, the technological "reality" forms the prevailing culture. On the other hand, the cultural patterns of action and using influence this technological "reality", change it, adapt it to the cultural "environment" (interaction of technology and culture). (3) These actual processes of change include two (ideal) forms: (a) the adjustment of existing cultural resp. social patterns to the new technological possibilities (persistence of the "traditions"); (b) the recombination of existing and the appearance or arising of (complete) new cultural resp. social patterns (surprises, mostly no foreseeable/predictable). (4) Cultural changes are not an automatic resp. direct result of technological possibilities. The use of these possibilities depends on the competencies, the values a. s. o. of the user(s); this is fundamentally influenced by the existing culture. – On this basis, the article at first will show some trends and problems in the current development of ICTs. Secondly some cultural and social implications of these trends will be discussed (examples: "evaluation and selection of a / the technological solution", "important criteria of IT-security", "security/safety culture" and "tacit presence"). Some conclusions finish the reflections.

Key words: *information-based society, technology-based society, culture of society, interaction of technology and culture, social patterns, IT security*

1. Introduction

The starting point is the following: Education is a "social event". That means:
(1) Education takes place in a (communication) community;
(2) Education takes place in a specific "environment": "Lebenswelt" (after Edmund Husserl and Jürgen Habermas) – "Lebenswelt" is understood as the relationship of the individual(s) to the everyday life, is the cultural "background" for action, behaviour, communication, understanding, …, that include (a) (non-problematic) basic convictions, traditional norms and values, rules and dispositions as the resp. result of socializing/education (cf. Banse 2005b), and (b) technological based "environment" and a technological "equipment" (esp. information and communication technologies – ICTs);
(3) Interactions between (2a) and (2b), e. g. in using the ICTs.

That is why we must pay attention to the changing technological "environment"(the following based partly on Banse 2005a, 2006a, 2006b, 2007).

2. Some trends in ICTs

Modern ICTs include
- telecommunication (e. g. ISDN/W-LAN, pay-tv, video-on-demand, interactive tv, teleshopping, telebanking, teleworking, …);
- net based using of personal computers (e. g. Internet, email, electronic banking, electronic business, electronic administration, e-learning, …).

These ICTs make possible
- new forms of communication (CMC), interaction and cooperation (also in education!);
- new forms for the achievement, the distribution and the saving/archieving of information / knowledge (also in education!)

We can say that these are facets of the so called "information society" ("e-society") with its technological, economic, political, social, cultural aspects and changes. It opened completely new possibilities for societies and individuals like e-business, e-learning, e-administration, e-culture a. s. o.

The most important directions in current developments in the field of the ICTs are:
- digitisation as a basic process: all sorts of content – i. e. text, sound (speech, music) and pictures (photos as well as moving) – have a homogeneous "form of existence": all of these different contents are in the same manner binarily coded, and can thus be transmitted, processed, and stored in the same man-

ner: "Digitisation […] means a combination of computerisation (already well-established, though now more cost-effective and powerful) and communications (now cheaper, faster, easier, popular)" (Clement/Beslay/Gilson 2001, p. 8, note 2);
- ubiquitous computing resp. ambient intelligence;
- networking of hardware components;
- convergence of the hardware components (personal computers, mobile phone, tv, radio, …: "multi media centre") and the transmission paths (wired and wireless, bluethooth);
- miniaturisation of elements, assemblies, and equipment.

These technological advances resp. innovations have become widespread only in the last 15 to 20 years. These are processes with a high speed and dynamics, based on the so-called "Moore's law": Doubling of the efficiency of processors resp. a corresponding miniaturisation or reduced prices of these units after 18 month!

This gives qualitatively modified possibilities in the *spatial* ("worldwide") as in the *temporal* ("on-line") dimension, as well as in the *mobility* ("from anywhere to everywhere") and in the *flexibility* ("multiple-use terminals") of information and communication.

New possibilities for education are connected with this development:
- information (WWW, multi-media);
- communication (email; mailing lists; news groups; chats; weblogs, SMS, MMS, …);
- playing (games, MUDs, music, videos, …);
- infotainment (combination of information and entertainment).

These are new fields of (social) experiences, of learning, of behaviour, … – and often quite different from the "traditional" fields like school, parents, ("old") media, …

3. Another side of ICTs

But there are other results of the dynamics and complexity of modern ICTs too: lack of transparency; simplicity of copying (and changing!) of data, files, texts, pictures, videos, a. s. o.; threats (dangers) arise.

Relevant problems, also for education, are: trust (in information, technologies, …); relevance (of information – "searching by google"); truth (of information – no "gatekeeper"); true authorship of documents, drafts, files ("plagiarism", …). These above all with regard to "security" ("society's vulnerability", "cyber-crime", "data security") and "privacy" ("data protection", "data mining", "data warehousing").

In the German language, the word *Sicherheit* ("*security*") is used in at least three senses: as a feeling of safety, as self-confidence, and as system security (of means for various purposes which can be manufactured and calculated). All the three uses are relevant for ICTs and computer-mediated communication (CMC): Security in ICTs and CMC means guaranteeing resp. enforcing individual protection goals, because one cannot assume that, in open networks, one can or should trust all participants a priori.

There are many hazards, and hence the corresponding protection goals. In general, a model is necessary (a) for identification (saying who you are) and (b) for authentication (proving you are who you say you are).

Types of hazards, dangers or threats in the field of ICTs are

- simulation of identity, falsification of data, denial of actions;
- spy out information, falsification of software, omission of actions;
- theft of files, software or/and hardware, falsification of events/processes, denial of author(ship);
- restriction of system-resources, abuse of system-resources.

Many of these threats are relevant for education! And: All these technological features have a cultural (and a social) dimension!

Protection goals in this direction are:

- *confidentiality*: Prevention of an unauthorized access to/acquisition of information;
- *integrity*: Prevention of an unauthorized manipulation/modification of information;
- *availability*: Prevention of an unauthorized impairment of functionality;
- *accountability*: Prevention of an inadmissible freedom from obligation;
- *authenticity*: Prevention of an inadmissible simulation of a (definite) person;
- *property rights, copyright*: Prevention of an unauthorized use of digital products (plagiarism!).

There are some tools to realise these goals, e. g. cryptography, electronic (digital) signature, electronic watermarks.

4. Some cultural and social implications

Before some cultural or social implications can be shown, it is necessary to explain what "culture" means in my opinion.

Culture can be understood as "the totality of conscious and unconscious collective *patterns of thinking, feeling* and *acting*, which are socially acquired and handed down by people as members of a society and constitute a specific characteristic of

this society that can be delimited" (Hermeking 2001, p. 18; italics and translated by me – G. B.). Or an other explication: "Culture is generally understood to mean the assumptions and beliefs that are rooted in a social system. It is reflected in a system of *values* and *norms*, as well as in *tangible characteristics* and the *models of behaviour* of the system's members" (Swiss Re 1998, p. 17; italics by me – G. B.).

In this understanding culture includes

a) values, convictions and norms, which are accepted in a group/community;
b) behaviours and practices, which are normal in a group/community;
c) (representational) artefacts as a basis of the life of a group/community;
d) "*tacit*" values and rules for action and behaviour, which are followed by the members of a group/community without knowledge about their whole scope.

Figure 1 shows with the "onion model" in a schematic way the relationship between (a) a technological system (as the "core") and its (b) technological-organizational, (c) legal and economic as well as (d) social and cultural "environment", symbolised through different "skins" or spheres. The figure shows with the arrows two idealized conceptualisations of the relationship between technology and culture with long traditions in research (especially in sociology and cultural sciences): (I) the so-called "cultural constructivism" – a given culture and society are an important influence of the process of technological design and development; (II) the so-called "technological determinism" – culture and society are influenced by a given technology.

But the reality is quite different from these idealized conceptualisations: Every skin influences the others, it is an interdependence between all. But the concrete kind of the reciprocal relationship between these spheres is depending on the concrete phase of design, selection or use of a technological system (e. g. ICTs!) in a given situation. So it is necessary to study and analyse this concrete situation in "space and time".

There are three levels for the analysis of cultural (and social) implications of modern ICTs (cf. Grunwald et al. 2006):

1) *micro level* of (separate) individuals (e. g. using of ICTs between constancy and change);
2) *meso level* of institutions, enterprises, … (e. g. using between traditional and modern ICTs);
3) *macro level* of society/societies (e. g. homogenisation resp. globalisation versus diversification or regionalisation).

The focus in this direction is the relationship between the technological *potential* for using and the *real resp. realised* socio-cultural *forms or patterns* of using. This depends on needs, access, competencies, financing, infrastructure, …

Four examples should give a short expression of that.

4.1. Example 1: Evaluation and selection of a technological solution

Figure 2 (after VDI 1991, p. 6) shows that two main components are relevant for the evaluation, selection (and use) of a technological solution (as a means for a given aim or purpose):

1) general conditions which include (a) natural conditions (raw materials, energy sources, man with biotic-psychic "equipement", …) and (b) social-cultural conditions (level of scientific and technological knowledge and "know how", level of technology, political situation, social values and norms, …);
2) individual dispositions which include (a) perspectives of sense and life attitudes, (b) individual tendencies, values and preferences and (c) hopes, expectations, desires, fears a. s. o.

These individual dispositions depend on culture!

4.2. Example 2: Important criteria for the selection of aa IT-security solution

The situation for the selection of a solution in the field of IT-security (or in some other technological fields) is shown in Figure 3. Four components influence decisions for a concrete IT-security solution: technological prerequisites and possibilities, economic expectations and procedures, legal rules and rules for regulations of damage as well as societal conditions and requirements. Between these components individual weigh of goods takes place (in German "Güterabwägung"). Weigh of goods is a method in ethics and law for the solving of conflicts. In cases of collisions of two "goods" the priority must be given the good with the higher weight as opposed to the good with the lower weight. The method of weigh of goods must be used in cases where a decision is necessary but two or more "goods" are in conflict. That means that these goods cannot realize together, at the same time. One must decide which good is to realize (the good with the higher weight) and which not (the good with the lower weight). But this method does not say anything about how one can find out which of two (or more!) goods is that with the higher and which good is that with the lower weight (cf. Lexikon 1987). So this process of weigh of goods is based on individual hopes, needs, desires and norms (tacit values included!) also (for more details cf. Banse 2006c).

In the case of this example this influences the individual meaning about disadvantages and advantages, dangers and chances, the pros and cons of any solution for IT-security. So we can find different individual solutions.

4.3. Example 3: Security/Safety Culture

Security/Safety culture is that "assembly of characteristics and attitudes in organisations and of individuals which establishes that, as an overriding priority, [nuclear] safety issues receive the attention warranted by their significance" (INSAG – International Safety Advisory Group, 1996 (in response to the accident at Chernobyl); cit. a. Swiss Re (1998), p. 18, brackets by me; G. B.). In this understanding security/safety culture is an expression of the given culture (for more details cf. Banse 2007).

4.4. Example 4: "Tacit presence"

There is internalised habituation to the using of technological systems, their obvious use. This follows often (cultural) patterns, norms and rules. Users of ICTs in an environment of "ubiquitous computing-" or mobile phones (also in e-learning!) are (mostly) no longer conscious, that the use a computer (tacit internalisation). This will break through usually in the cases of disruption resp. trouble or in the moment of transfer of technology (in other cultural conditions!).

5. Conclusions

1. Education in a knowledge-based society takes place in a technology-based society. Therefore, we must pay attention to the technological possibilities and changes.
2. On the one hand, the technological "reality" forms the prevailing culture. On the other hand, the cultural patterns of action and using influence this technological "reality", change it, adapt it to the cultural "environment" (interaction of technology and culture).
3. These actual processes of change include two (ideal) forms: (a) the adjustment of existing cultural/social patterns to the new technological possibilities (persistence of the "traditions") and (b) the recombination of existing and the appearance/arising of (complete) new cultural or social patterns (surprises, mostly not foreseeable/predictable).
4. Cultural changes are not an automatic or direct result of technological possibilities. The use of these possibilities depends on the competences, the values a. s. o. of the user(s) – this is fundamentally influenced by the existing culture.
5. There is not only a need for technological innovations, but also a need for a socio-cultural innovation, if we want to have a cultural change (new indi-

vidual resp. collective patterns of action and communication). In this direction education can – or better – must help.

6. There is a need for media competence (including knowledge about chances and dangers resp. risks of ICTs). Education must give a contribution in this direction.

Figure 1: The "Onion model"

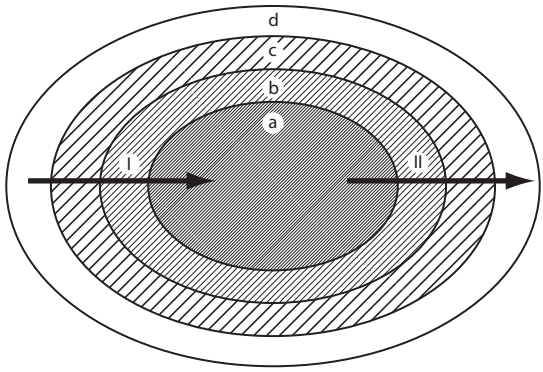


Figure 2: Evaluation and selection of a resp. technological solution (after VDI 1999, p. 6)

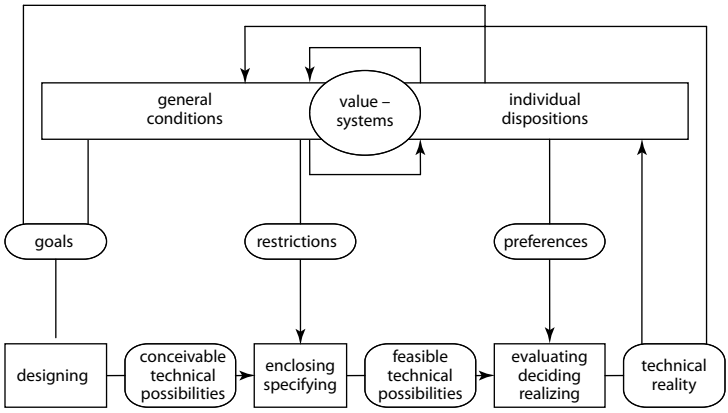
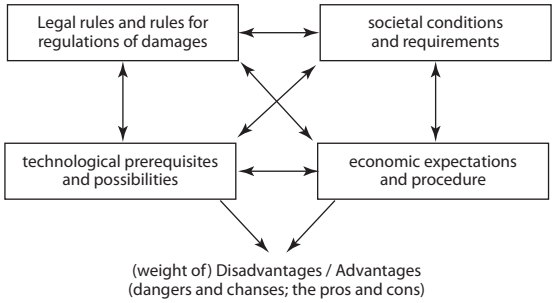


Figure 3: Important criteria of the selection of an IT-security solution



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